

What is claimed is:

sub A4
1. An enzymatically blocked-deesterified pectin displaying pseudoplasticity and substantially no phase separation in aqueous solution comprising at least one polyvalent cation.

2. The enzymatically blocked-deesterified pectin of claim 1, wherein the amount of polyvalent ion is from about 10 ppm to about 2,000 ppm.

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3. The enzymatically blocked-deesterified pectin of claim 2, wherein the polyvalent is selected from one of aluminum ions, iron ions, manganese ions, calcium ions, and manganese ions.

4. The enzymatically blocked-deesterified pectin of claim 3, wherein the polyvalent is calcium ion, and wherein the amount of calcium ion is from about 10 ppm to about 2,000 ppm.

5. The enzymatically blocked-deesterified pectin of claim 4, wherein the amount of calcium ion is from about 200 ppm to about 600 ppm.

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6. The enzymatically blocked-deesterified pectin of claim 1, wherein the amount of phase separation in the aqueous solution is at most about 10%.

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7. The enzymatically blocked-deesterified pectin of claim 6, wherein the amount of phase separation in the aqueous solution is at most about 5%.

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8. The enzymatically blocked-deesterified pectin of claim 7, wherein the amount of phase separation in the aqueous solution is at most about 3%.

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~~9.~~ The enzymatically blocked-deesterified pectin of claim 1 having a degree of esterification from about 45 to 65 %.

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~~10.~~ The enzymatically blocked-deesterified pectin of claim 9 having a degree of esterification from about 55 to 59 %.

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~~11.~~ The enzymatically blocked-deesterified pectin of claim 9 having a calcium sensitivity greater than about 200 cP or a calcium fraction greater than 20, and a Δ degree of esterification from about 5 to 25 %.

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12. The enzymatically blocked-deesterified pectin of claim 11 having a calcium sensitivity greater than about 200 cP or a calcium fraction greater than 20, and a Δ degree of esterification from about 8 to 15 %.

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~~13.~~ The enzymatically blocked-deesterified pectin of claim 1 prepared by treating isolated high methoxyl pectin with enzyme.

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~~14.~~ The enzymatically blocked-deesterified pectin of claim 13 wherein the enzyme is extracted from plant tissues selected from at least one of apples, apricots, avocados, bananas, berries, limes, grapefruits, mandarins, cherries, currants, grapes, mangos, papayas, passion fruits, peaches, pears, plums, beans, carrots, cauliflowers, cucumbers, leeks, onions, peas, potatoes, radishes and tomatoes.

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~~15.~~ The enzymatically blocked-deesterified pectin of claim 13 wherein the enzyme is papain.

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~~16.~~ The enzymatically blocked-deesterified pectin of claim 13 having degree of esterification from about 45 to 65 % when the degree of esterification of the isolated high methoxyl pectin is from about 68 to 72 %.

²¹
~~17.~~ The enzymatically blocked-deesterified pectin of claim ²⁰~~16~~ having degree of esterification from about 55 to 59 % when the degree of esterification of the isolated high methoxyl pectin is from about 68 to 72 %.

5 ²²
~~18.~~ The enzymatically blocked-deesterified pectin of claim ¹⁷~~13~~, wherein the isolated high methoxyl pectin has a degree of esterification greater than about 60%.

10 ²³
~~19.~~ The enzymatically blocked-deesterified pectin of claim ²²~~18~~, wherein the isolated high methoxyl pectin has a degree of esterification greater than about 67%.

²⁴
~~20.~~ The enzymatically blocked-deesterified pectin of claim ¹⁷~~13~~, wherein the isolated high methoxyl pectin is in an aqueous form or powder form.

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~~21.~~ The enzymatically blocked-deesterified pectin of claim ¹⁷~~13~~, wherein the isolated high methoxyl pectin is obtained from at least one of citrus peels, apple juices, apple ciders, apple pomade, sugar beets, sunflower heads, vegetables or waste products from plants selected from at least one of apples, sugar beet, sunflower and citrus fruits.

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~~22.~~ The enzymatically blocked-deesterified pectin of claim ²⁵~~21~~, wherein the isolated high methoxyl pectin is obtained from at least one of limes, lemons, grapefruits, tangerines and oranges.

25 ¹⁵
~~23.~~ The enzymatically blocked-deesterified pectin of claim ¹¹~~1~~ prepared by treating the isolated high methoxyl pectin with an enzyme, wherein the enzyme is extracted from plant tissues selected from at least one of apples, apricots, avocados, bananas, berries, limes, grapefruits, mandarins, cherries, currants, grapes, mangos,

papayas, passion fruits, peaches, pears, plums, beans, carrots, cauliflowers, cucumbers, leeks, onions, peas, potatoes, radishes and tomatoes.

5 *sub A9* ~~24~~ The enzymatically blocked-deesterified pectin of claim 23 having degree of esterification from about 45 to 65 % when the degree of esterification of the isolated high methoxyl pectin is from about 68 to 72 %.

10 ~~25~~ A process for producing an enzymatically blocked-deesterified pectin which comprises treating at least one isolated high methoxyl pectin with at least one deesterifying enzyme, wherein the enzymatically blocked-deesterified pectin displays pseudoplasticity and substantially no phase separation in aqueous solution comprising at least one polyvalent cation.

15 ~~26~~ ³⁰ ~~29~~ The process for producing an enzymatically blocked-deesterified pectin of claim 25, wherein the amount of polyvalent ion is from about 10 ppm to about 2,000 ppm.

20 *sub A10* ~~27~~ The process for producing an enzymatically blocked-deesterified pectin of claim 26, wherein the polyvalent is selected from one of aluminum ions, iron ions, manganese ions, calcium ions, and manganese ions.

25 ~~28~~ ³² ~~31~~ The process for producing an enzymatically blocked-deesterified pectin of claim 27, wherein the polyvalent is calcium ion, and wherein the amount of calcium ion is from about 10 ppm to about 2,000 ppm.

~~29~~ ³³ ~~32~~ The process for producing an enzymatically blocked-deesterified pectin of claim 28, wherein the amount of calcium ion is from about 200 ppm to about 600 ppm.

³⁶
~~30~~ The process for producing an enzymatically blocked-deesterified pectin of claim ~~25~~²⁹, wherein the amount of phase separation in the aqueous solution is at most about 10%.

5 ³⁷
~~31~~ The process for producing an enzymatically blocked-deesterified pectin of claim ~~30~~³⁶, wherein the amount of phase separation in the aqueous solution is at most about 5%.

10 ³⁸
~~32~~ The process for producing an enzymatically blocked-deesterified pectin of claim ~~31~~³⁷, wherein the amount of phase separation in the aqueous solution is at most about 3%.

15 ³⁹
~~33~~ The process for producing an enzymatically blocked-deesterified pectin of claim ~~25~~²⁹, wherein the enzyme is extracted from plant tissues selected from at least one of apples, apricots, avocados, bananas, berries, limes, grapefruits, mandarins, cherries, currants, grapes, mangos, papayas, passion fruits, peaches, pears, plums, beans, carrots, cauliflowers, cucumbers, leeks, onions, peas, potatoes, radishes and tomatoes.

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~~34~~ The process for producing an enzymatically blocked-deesterified pectin of claim ~~25~~²⁹, wherein the enzyme is papain.

25 ⁴¹
~~35~~ The process for producing an enzymatically blocked-deesterified pectin of claim ~~25~~²⁹, wherein the isolated high methoxyl pectin is obtained from at least one of citrus peels, apple juices, apple ciders, apple pomade, sugar beets, sunflower heads, vegetables or waste products from plants selected from at least one of apples, sugar beet, sunflower and citrus fruits.

⁴²
~~36~~ The process for producing an enzymatically blocked-deesterified

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pectin of claim ~~35~~, wherein the isolated high methoxyl pectin is obtained from at least one of limes, lemons, grapefruits, tangerines and oranges.

43
37. The process for producing an enzymatically blocked-deesterified pectin of claim ~~25~~, wherein the isolated high methoxyl pectin is in an aqueous form or powder form.

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38. The process for producing an enzymatically blocked-deesterified pectin of claim ~~25~~, wherein the isolated high methoxyl pectin has a degree of esterification greater than about 60 %.

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39. The process for producing an enzymatically blocked-deesterified pectin of claim ~~38~~, wherein the isolated high methoxyl pectin has a degree of esterification greater than about 67 %.

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40. The process for producing an enzymatically blocked-deesterified pectin of claim 25, wherein if the degree of esterification of the isolated high methoxyl pectin is from about 68 to 72 %, the degree of esterification of the enzymatically blocked-deesterified pectin is from about 45 to 65 %.

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41. The process for producing an enzymatically blocked-deesterified pectin of claim ~~40~~, wherein if the degree of esterification of the isolated high methoxyl pectin is from about 68 to 72 %, the degree of esterification of the enzymatically blocked-deesterified pectin is from about 55 to 59 %.

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42. The process for producing an enzymatically blocked-deesterified pectin of claim ~~25~~, wherein the isolated high methoxyl pectin is obtained from at least one of citrus peels, apple juices, apple ciders, apple pomade, sugar beets, sunflower heads, vegetables or waste products from plants selected from at least one

of apples, sugar beet, sunflower and citrus fruits.

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43. The process for producing an enzymatically blocked-deesterified
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pectin of claim 42, wherein the isolated high methoxyl pectin is obtained from at
5 least one of limes, lemons, grapefruits, tangerines and oranges.

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44. The process for producing an enzymatically blocked-deesterified
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pectin of claim 43, wherein the isolated high methoxyl pectin is in an aqueous form
or powder form.

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45. The process for producing an enzymatically blocked-deesterified
pectin of claim 44, wherein the enzymatically blocked-deesterified pectin has a
calcium sensitivity greater than about 200 cP or a calcium fraction greater than 20,
and a Δ degree of esterification from about 5 to 25 %.

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46. The process for producing an enzymatically blocked-deesterified
pectin of claim 45, wherein the enzymatically blocked-deesterified pectin has a
calcium sensitivity greater than about 200 cP or a calcium fraction greater than 20,
and a Δ degree of esterification from about 8 to 15 %.

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47. The process for producing an enzymatically blocked-deesterified
pectin of claim 46, wherein the enzymatically blocked-deesterified pectin has a
degree of esterification from about 45 to 65%.

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48. A process for suspending insoluble components in an acidic liquid
system which comprises adding enzymatically blocked-deesterified pectin that has
been deesterified with enzyme to acidic liquid system, wherein the enzymatically
blocked-deesterified pectin displays pseudoplasticity and substantially no phase
separation in aqueous solution comprising at least one polyvalent cation.

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~~49~~

The process of claim ~~48~~, wherein the amount of polyvalent ion is from about 10 ppm to about 2,000 ppm.

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~~The process of claim 49, wherein the polyvalent is selected from one of aluminum ions, iron ions, manganese ions, calcium ions, and manganese ions.~~

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~~51~~

The process of claim ~~50~~, wherein the polyvalent is calcium ion, and wherein the amount of calcium ion is from about 10 ppm to about 2,000 ppm.

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~~52~~

The process of claim ~~51~~, wherein the amount of calcium ion is from about 200 ppm to about 600 ppm.

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~~53~~

The process of claim ~~48~~, wherein the amount of phase separation in the aqueous solution is at most about 10%.

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~~54~~

The process of claim ~~53~~, wherein the amount of phase separation in the aqueous solution is at most about 5%.

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~~55~~

The process of claim ~~54~~, wherein the amount of phase separation in the aqueous solution is at most about 3%.

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56.

~~The process of claim 48, wherein the enzymatically blocked-deesterified pectin has a calcium sensitivity greater than about 200 cP or a calcium fraction greater than 20, and a Δ degree of esterification from about 5 to 25 %.~~

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~~57~~

The process of claim ~~56~~ further comprises adding calcium ions to the acidic liquid system.

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~~58~~

The process of claim ~~57~~, wherein the amount of calcium ions is from

about 10 ppm to about 2000 ppm.

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~~59.~~ The process of claim ~~58~~⁶⁸, wherein the amount of calcium ions is from about 50 ppm to about 1000 ppm.

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~~60.~~ The process of claim ~~59~~⁶⁹, wherein the amount of calcium ions is from about 200 ppm to about 600 ppm.

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~~61.~~ The process of claim ~~57~~⁶⁷, wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.001 to about 0.2.

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~~62.~~ The process of claim ~~61~~⁷¹, wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.005 to about 0.01.

⁷³
~~63.~~ The process of claim ~~62~~⁷², wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.02 to about 0.06.

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~~64.~~ The process of claim ~~56~~⁶⁶, wherein the acidic liquid system comprises protein.

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~~65.~~ The process of claim ~~60~~⁷⁶, wherein the protein is at least one of soy, whey, and casein.

⁷⁶
~~66.~~ The process of claim ~~57~~⁶⁷ further comprises adding a food, cosmetic, or pharmaceutical product to the acidic liquid system, wherein the food product comprises at least one of fruit and vegetable.

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~~67.~~ The process of claim ~~48~~⁵⁶, wherein the acidic liquid system comprises calcium ions.

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~~68~~ The process of claim ⁷⁷~~67~~, wherein the amount of calcium ions is from about 10 ppm to about 2000 ppm.

⁷⁹
~~69~~ The process of claim ⁷⁸~~68~~, wherein the amount of calcium ions is from about 50 ppm to about 1000 ppm.

⁸⁰
~~70~~ The process of claim ⁷⁹~~69~~, wherein the amount of calcium ions is from about 200 ppm to about 600 ppm.

⁸¹
~~71~~ The process of claim ⁷⁷~~67~~, wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.005 to about 0.01.

⁸²
~~72~~ The process of claim ⁸¹~~71~~, wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.02 to about 0.06.

⁸³
~~73~~ The process of claim ⁸²~~72~~, wherein the acidic liquid system comprises protein.

⁸⁴
~~74~~ The process of claim ⁷⁷~~67~~, wherein the acidic liquid system comprises protein, wherein the protein is at least one of soy, whey, and casein.

⁸⁵
~~75~~ The process of claim ⁷⁷~~67~~ further comprises adding a food, cosmetic, or pharmaceutical product to the acidic liquid system.

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~~76~~ The process of claim ⁸⁵~~75~~, wherein the food product comprises at least one of fruit and vegetable.

⁸⁷
~~77~~ The process of claim ⁵⁶~~48~~, wherein the amount of the enzymatically esterified pectin is from about 0.01% to about 3.0% by dry weight in the final acidic

liquid system.

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78. The process of claim 77, wherein the amount of the enzymatically esterified pectin is from about 0.05% to about 0.6% by dry weight in the final acidic liquid system.

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79. The process of claim 78, wherein the amount of the enzymatically esterified pectin is from about 0.15% to about 0.35% by dry weight in the final acidic liquid system.

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80. The process of claim 78, wherein the pH of the acidic liquid system is from about 2.0 to about 5.

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81. The process of claim 80, wherein the pH of the acidic liquid system is from about 2.5 to about 4.5.

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82. The process of claim 81, wherein the pH of the acidic liquid system is from about 3 to about 4.

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83. The process of claim 48, wherein the enzymatically blocked-deesterified pectin has a calcium sensitivity greater than about 200 cP or a calcium fraction greater than 20 cP, and a Δ degree of esterification from about 5 to 25 %.

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84. The process of claim 48, wherein the enzymatically blocked-deesterified pectin is prepared by deesterifying an isolated high methoxyl pectin with an enzyme, wherein the enzyme is extracted from plant tissues selected from at least one of apples, apricots, avocados, bananas, berries, limes, grapefruits, mandarins, cherries, currants, grapes, mangos, papayas, passion fruits, peaches, pears, plums, beans, carrots, cauliflowers, cucumbers, leeks, onions, peas, potatoes,

radishes and tomatoes.

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85. The process of claim 48, wherein the enzymatically blocked-
deesterified pectin is prepared by deesterifying an isolated high methoxyl pectin
5 with an enzyme, wherein the enzyme is papain.

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86. The process of claim 48, wherein the enzymatically blocked-
deesterified pectin has a degree of esterification from about 45 to 65 % when the
degree of esterification of the isolated high methoxyl pectin is from about 68 to 72%.

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87. The process of claim 86, wherein the enzymatically blocked-
deesterified pectin has a degree of esterification from about 55 to 59 % when the
degree of esterification of the isolated high methoxyl pectin is from about 68 to 72%.

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88. A stabilized acidic liquid system comprising (a) at least one
enzymatically blocked-deesterified pectin that displays pseudoplasticity and
substantially no phase separation in aqueous solution comprising at least one
polyvalent cation; and (b) at least one acidic liquid solution.

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89. The stabilized acidic liquid system of claim 88, wherein the amount
of polyvalent ion is from about 10 ppm to about 2,000 ppm.

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90. The stabilized acidic liquid system of claim 89, wherein the
polyvalent is selected from one of aluminum ions, iron ions, manganese ions,
calcium ions, and manganese ions.

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91. The stabilized acidic liquid system of claim 90, wherein the
polyvalent is calcium ion, and wherein the amount of calcium ion is from about 10
ppm to about 2,000 ppm.

¹⁰⁴
~~92~~ The stabilized acidic liquid system of claim ~~91~~¹⁰³, wherein the amount of calcium ion is from about 200 ppm to about 600 ppm.

¹⁰⁷
~~93~~ The stabilized acidic liquid system of claim ~~88~~¹⁰⁰, wherein the amount of phase separation in the aqueous solution is at most about 10%.

¹⁰⁹
~~94~~ The stabilized acidic liquid system of claim ~~93~~¹⁰⁷, wherein the amount of phase separation in the aqueous solution is at most about 5%.

¹⁰⁹
~~95~~ The stabilized acidic liquid system of claim ~~94~~¹⁰⁸, wherein the amount of phase separation in the aqueous solution is at most about 3%.

¹¹⁰
96. The stabilized acidic liquid system of claim ~~88~~¹⁰⁰ further comprises adding calcium ions to the acidic liquid solution.

¹¹¹
~~97~~ The stabilized acidic liquid system of claim ~~96~~¹¹⁰, wherein the amount of calcium ions is from about 10 ppm to about 2000 ppm.

¹¹²
98. The stabilized acidic liquid system of claim ~~97~~¹¹¹, wherein the amount of calcium ions is from about 50 ppm to about 600 ppm.

¹¹³
~~99~~ The stabilized acidic liquid system of claim ~~96~~¹¹⁰, wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.001 to about 0.2.

¹¹⁴
~~100~~ The stabilized acidic liquid system of claim ~~99~~¹¹³, wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.005 to about 0.01.

115
~~101~~ The stabilized acidic liquid system of claim ~~100~~¹¹⁴, wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.02 to about 0.06.

5 116
~~102~~ The stabilized acidic liquid system of claim ~~96~~¹¹⁰, wherein the acidic liquid solution comprises protein.

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~~103~~ The stabilized acidic liquid system of claim ~~102~~¹¹⁶, wherein the protein is at least one of soy, whey, and casein.

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3-02
~~104~~ The stabilized acidic liquid system of claim ~~96~~¹¹⁰ further comprises a food, cosmetic, or pharmaceutical product to the acidic liquid solution. ^{add in 5}

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~~105~~ The stabilized acidic liquid system of claim ~~104~~¹¹⁸, wherein the food product comprises at least one of fruit and vegetable.

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~~106~~ The stabilized acidic liquid system of claim ~~88~~¹⁰⁰, wherein the acidic liquid solution comprises calcium ions.

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~~107~~ The stabilized acidic liquid system of claim ~~106~~¹²⁰, wherein the amount of calcium ions is from about 10 ppm to about 2000 ppm.

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~~108~~ The stabilized acidic liquid system of claim ~~107~~¹²¹, wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.001 to about 0.2.

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~~109~~ The stabilized acidic liquid system of claim ~~106~~¹²⁰, wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.005 to about 0.01.

¹²⁴
~~110.~~ The stabilized acidic liquid system of claim ~~109~~¹²³, wherein the weight ratio of the enzymatically deesterified pectin and the calcium ions is from about 0.02 to about 0.06.

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~~111.~~ The stabilized acidic liquid system of claim ~~110~~¹²⁴, wherein the amount of calcium ions is from about 50 ppm to about 1000 ppm.

¹²⁶
~~112.~~ The stabilized acidic liquid system of claim ~~106~~¹²⁰, wherein the acidic liquid solution comprises protein, wherein the protein is at least one of soy, whey, and casein.

¹²⁷
~~113.~~ The stabilized acidic liquid system of claim ~~106~~¹²⁰, further comprises adding a food, cosmetic, or pharmaceutical product to the acidic liquid solution.

¹²⁸
~~114.~~ The stabilized acidic liquid system of claim ~~113~~¹²⁷, wherein the food product comprises at least one of fruit and vegetable.

¹²⁹
~~115.~~ The stabilized acidic liquid system of claim ~~88~~¹⁰⁰, wherein the amount of the enzymatically esterified pectin is from about 0.01% to about 3.0% by dry weight in the final acidic liquid solution.

¹³⁰
~~116.~~ The stabilized acidic liquid system of claim ~~115~~¹²⁹, wherein the amount of the enzymatically esterified pectin is from about 0.05% to about 0.6% by dry weight in the final acidic liquid solution.

25 ¹³¹
~~117.~~ The stabilized acidic liquid system of claim ~~88~~¹⁰⁸, wherein the pH of the acidic liquid solution is from about 2.5 to about 5.

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~~118.~~ The stabilized acidic liquid system of claim 88, wherein the

enzymatically blocked-deesterified pectin has a calcium sensitivity greater than about 200 cP or a calcium fraction greater than 20, and a Δ degree of esterification from about 5 to 25 %.

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¹³³
~~119.~~ The stabilized acidic liquid system claim ~~88~~ ¹⁰⁰ wherein the enzymatically blocked-deesterified pectin is prepared by deesterifying an isolated high methoxyl pectin with an enzyme, wherein the enzyme is extracted from plant tissues selected from at least one of apples, apricots, avocados, bananas, berries, limes, grapefruits, mandarins, cherries, currants, grapes, mangos, papayas, passion

10 fruits, peaches, pears, plums, beans, carrots, cauliflowers, cucumbers, leeks, onions, peas, potatoes, radishes and tomatoes.

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~~120.~~ The stabilized acidic liquid system of claim ~~88~~ ¹⁰⁰ wherein the enzymatically blocked-deesterified pectin is prepared by deesterifying an isolated high methoxyl pectin with an enzyme, wherein the enzyme is papain.

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~~121.~~ The stabilized acidic liquid system of claim 88, wherein the enzymatically blocked-deesterified pectin has a degree of esterification from about 45 to 65 % when the degree of esterification of the isolated high methoxyl pectin is from about 68 to 72 %.

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